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Water in Metro Cebu: The Case for Policy and Institutional Reforms*

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INTRODUCTION

Metro Cebu is the second largest urban center in the country, with a population of more than 1.3 million people and covering 3 cities and 5 municipalities within 544 sq. km. of land area.[1] It comprises almost half of the entire population of Cebu province, but only 14 percent of its land area. About half of Metro Cebu's population and land area are in Cebu City which has historically been the commercial and service center of the Visayas and Northern Mindanao regions, as well as the home base of the country's major shipping companies. Outside Metro Manila, Metro Cebu has the highest concentration of major hospital, educational, and medical training services.

Over the past decade, Metro Cebu has been drawing substantial industrial investments, attracted by the rapid infrastructure (air, port, and land transport facilities) development, the presence of trainable manpower, strong trade and services network, and adequate living amenities. Metro Cebu currently accounts for 70 percent of Central Visayas' industrial output; the Mactan Export Processing Zone alone with its 101 firms and over 38,000 employees, contributes over 60 percent of the region's total exports.

Tourism has also become a major source of growth of its economy, as Metro Cebu has become the top destination of foreign tourists. Aside from its historical significance and natural attractions, peace and order condition is relatively good, infrastructure is well-developed, and modern shipping facilities provide access to other tourist destinations in nearby islands.

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[1] Included are Cebu City, Mandaue City, Lapu-Lapu City, Cordova, Talisay, Consolacion, Liloan, and Compostela.

In contrast to the overall progressive economic development of Metro Cebu, the state of its water resource management and quality of its water utility service is a serious concern of the various sectors of the economy;[2] the watersheds surrounding Metro Cebu have long been considered in a critical state; access to piped water connection is limited; groundwater pumping is virtually unregulated, despite reported depletion of groundwater reserves and saline intrusion of coastal aquifers. The lack of sewerage collection and treatment efforts, as well as weak regulation of industrial effluents and nonpoint sources of water pollution has adversely affected people's health and quality of rivers, streams and other water bodies.

The purpose of this paper is to analyze the policy and institutional factors that may be constraining the efficient, equitable, and sustainable management of water resource in Metro Cebu. Because of certain unique characteristics of water (and related factors such as watersheds), purely market mechanisms will fail to achieve an economically efficient, socially equitable, and environmentally sustainable development, distribution, and use of water resources. First, both surface and groundwater have public good characteristics. Excluding nonpayers from its consumption is difficult and costly. Even though overuse of ground or surface water may already be raising cost of water withdrawal, the resulting cost increase is often viewed as marginal, especially by large users. Hence, market prices may not adequately reflect the diminishing availability of quality water.

Second, environmental effects or externalities arising from the production and consumption of water impose costs to society. At the production stage, the construction of dams to harness surface water run-off may damage the ecosystem, dislocate affected population, and threaten endangered species. Overpumping of groundwater resources will lead to salt water intrusion, cause land subsidence, and raise cost of abstraction for future users. At the consumption stage, negative externalities may arise from untreated domestic sewer and industrial wastewater or effluents

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[2]Indeed, a multi-stakeholder coalition called the Cebu Uniting for Sustainable Water (CUSW) was formed to lobby for improvements in water resource management policy. Thus far, this is the only such organized effort in the country, reflecting the serious nature of the problem in Metro Cebu.

accompanying water use through the impact of water pollution on public health and quality of water bodies.

Finally, production and distribution of surface and groundwater are typically characterized by strong economies of scale. Often, the operation of a centralized water distribution system may be characterized as natural monopolies that would need to be regulated to achieve efficiency and prevent the extraction of monopoly rents.

The government, therefore, has a critical role in establishing an incentive, regulatory, and institutional framework that will facilitate the achievement of water resource management objectives. Failure to achieve these objectives may often be attributed to the a) lack of an integrated, holistic approach in addressing the inherently interrelated issues of water supply planning, and operation, demand management, pollution control, watershed and groundwater protection; b) over-reliance on "command and control" or administrative/legal mechanisms in allocating scarce water resources and controlling water pollution which have proven to be inadequate; c) dominance and direct involvement of the public sector in water supply operation although government operations are typically characterized by faulty incentive structure and lack of effective competition; and finally d) a water pricing policy that does not recognize water as a scarce (and not a free) resource nor account for the pervasive externalities associated with production and consumption of water.

WATER SUPPLY SITUATION

Almost all freshwater used in Metro Cebu is derived from groundwater aquifers. The government-owned Metro Cebu Water District (MCWD) abstracts about 110,000 cum/d through its 81 wells in various parts of the service area.[3] Its piped water distribution system serves only about 23 percent of total households and a smaller proportion of the industrial and commercial and establishments for an average of 18 hours per day. Household or domestic use accounts for about 70 percent of the volume

[3]Only a small amount of water (1% of total) is derived from the Buhisan Dam which has long been heavily silted.

of water sold; whereas industrial, commercial and other users take up the remaining 30 percent.

The large majority of households, industrial and commercial firms, therefore, have to rely on private wells (self-supplied or through private waterworks) and private water vendors. Many of those with MCWD connections also use own wells or vended water in conjunction with its piped water, or invest in booster pumps, cisterns and storage tanks to cope with the rationed supply (Largo et al. 1998; Inocencio et al. 1998; Expertelligence 1997). Vended water may be picked up from the source, frequently a neighbor with MCWD connection or delivered through a hose, cart, jeep or large trucks.

Except for the MCWD wells, there are no available information to estimate the rate of groundwater pumping directly. Although industries, commercial establishments and other large users of groundwater are required to register with the National Water Resource Board (represented by MCWD in Metro Cebu), only a small fraction actually do so. As of 1997, the total number of registered private wells was only 151, and these were dominated by residential subdivisions (126) for domestic use (Table 1).

Table 1. Estimate of Urban Water Consumption by Source of Supply, 1995 (Thousand cum/d)

	Household	Others	Total
MCWD	47.6 (24)*	19.5 (23)	67.1 (24)
Private wells and others	148.1 (76)	64.4 (77)	212.5 (76)
Total	195.7 [70]**	83.9 [30[	279.6

* Figures in parenthesis are percentage shares of MCWD or other sources to water use by households or other users.

** Figures in brackets are percentage shares of households or other users to total water use.

Note: The total water use is derived based on a conservative assumption about size of water demand for industrial, commercial, and other users. See PIDS 1 estimate of water demand in Table 3.

The number of registered private wells for industrial/commercial uses was only 16, 5 for irrigation, and 4 for fisheries. A recent inventory of wells by the Water Resource Center (WRC) in Mactan, which included individual household wells, reported a total of more than 5000. Based on fragmented data, WRC also estimated that for Metro Cebu, the total number of wells might be within the range of 20,000-25,000 (Walag 1996).

In the absence of any systematic data, total groundwater abstraction has been typically estimated indirectly by deriving estimates of total water consumption for various uses. None of the available estimates, however, includes the use of groundwater for fishery, especially for prawn farming in Talisay and Cordova, nor for agriculture, primarily for the vegetables, cutflower, hog, and poultry farms. Moreover, there is hardly any reliable basis for estimating consumption of water for nonhousehold uses. In most cases, industrial and commercial uses of water are estimated quite crudely by multiplying water intensity ratio per sq. meter to projected total industrial and commercial lot area.

Interestingly, various estimates of groundwater abstraction since 1990 have been within a narrow range of 235,000 to 243,000 cum/d (CIADPS 1994; Haman 1991; Walag 1996). Based on a more recent population census — with a different assumption on per capita water use and different methods for estimating nonhousehold water use — our 1995 estimate of urban water consumption indicates an even higher figure for groundwater abstraction ranging from a low of about 280,000 to a high of 390,000 cum/d (see PIDS1 and PIDS2 rows in Table 3). Whichever estimate of groundwater abstraction is correct, however, it is clear that the Metro Cebu's groundwater aquifer is being rapidly depleted. Estimates of natural recharge rate, a measure of safe or sustainable groundwater yield, vary from 130,000 to 160,000 cum/d, only about half of the estimated rates of groundwater abstraction (CIADPS 1994; Haman 1991; Walag 1996; JICA 1998). Consequently, saltwater has long intruded the coastal areas and pumping costs have increased as water table has fallen.

The same estimate of total water consumption by use allows us to infer the relative importance of private wells and water vendors together as sources of water (Table 2). Based on PIDS1, low estimate of total water consumption, at least 75 percent of water consumption of both households

Table 2. Distribution of Registered Private Wells in Metro Cebu, by Municipality, 1997

Municipality	Number	
	Wells	Registrants
Cebu City	26	22
Compostela	1	1
Consolacion	3	3
Cordova	0	0
Lapu-Lapu	3	3
Liloan	21	18
Mandaue	16	6
Talisay	81	75
Total	151	128

and other users seems to originate from non-MCWD sources. Although part of vended water, particularly those sold to households, is actually MCWD water, the 75 percent may still underestimate the true value because the estimated nonhousehold water consumption is a minimum one. More likely, the proportion of industrial and commercial water consumption obtained through private wells and water vendors would be somewhere between 75 percent and 90 percent, the upper limit.

FUTURE SOURCES OF WATER SUPPLY

As early as the mid-1970s, the limited groundwater resources relative to water demand of a rapidly growing Metro Cebu economy and the need to develop surface sources of water supply have been recognized based on the studies conducted by the Kampsax-Kruger Lahmeyer International

(KKLI) and by the Cebu Consultants in the early 1980s. The Balamban River and the Mananga River were identified as potential sources of surface water, and in the late 1970s Camp Dresser and McKee already designed and prepared the tender documents for the construction of the Lusaran Dam to create a catchment area for the Balamban River which can supply 160,000 cum/d of water for Metro Cebu. However, the high cost of the project, together with the poor economic conditions in the early 1980s, prevented its implementation.

By 1985, Cebu Consultants have recommended the development of the Mananga River as a lower cost alternative. In Phase I, an infiltration system is envisaged to increase the recharge rate downstream and make use of the storage capacity of alluvial material in the Jaclupan Valley. This project involves the construction of a diversion weir, sedimentation and infiltration facilities, and a wellfield which can produce 33,000 cum/d of water, about three times higher than the natural safe groundwater yield of about 10,000 cum/d. In Phase II, an additional water supply of 100,000 cum/d will be generated by building a 90 meter high dam upstream of the Mananga Phase I project, a tunnel connecting the reservoir and a proposed treatment plant at Tisa, above the ground concrete reservoir, and additional transmission and distribution pipe lines.

Up until 1997, MCWD production capacity has been increased primarily by exploiting more groundwater resources and reducing the rate of nonrevenue water through investments under its "Program I." Between 1986 and 1997, water production increased from about 79,000 up to 122,000 cum/d and the rate nonrevenue water declined from 52 percent down to 38 percent. These investments included the construction of a well-field north of Cebu at Compostela and as part of "Program II", the implementation of Phase I of the Mananga River project. These two projects, however, have not yet been fully operational for a number of reasons.

Although the Compostela wellfield was completed way back in 1992, the local government has continually refused to allow its operation. Fears have been strongly expressed about possible adverse effects on the pumping yields of small wells within the area. These small wells are used not only for domestic purposes but also for irrigation of vegetable farms, the main source of livelihood of households residing within the vicinity. With the greater autonomy of local governments under the Local Government Code and the apparent lack of clear guidelines or mechanisms for resolving conflicts related to inter-LGU water transfers, nor about competing intersectoral use of water, the Compostela wellfields remain non-operational, yielding no return on investments while the infrastructure investments is depreciating over time.

The Mananga Phase I project that was begun in 1993 has not been fully completed up to this time as the contractor is unable to procure and install the multi-layer sand filter over the artificial recharge area with the remaining undisbursed funds of 5 percent of project cost. Apparently, the cost of the specified sand is much higher than anticipated because it turned out to be unavailable in the country and may have to be imported or local sand may have to undergo processing which is costly. Without the artificial recharge system, however, the safe yield of the aquifer will be much lower so that investments in pumping capacity, diversion weir, and other structures would be wasted. Nonetheless, the project began operation in late 1997, pumping below target capacity, but at rates that were still unsustainable over the medium and long-term targets.

Efforts to develop surface sources of water supply are also being undertaken, but thus far no project has materialized. In 1991, the feasibility study for the Mananga Phase II was completed by the Electrowatt Engineering Services (EES) for possible funding by the Asian Development Bank, but as the Mananga Phase I was still to be started in 1993, no action was taken. In the meantime, an unsolicited Build Operate Transfer (BOT) proposal for the Mananga Phase II was accepted from the Johan Holdings Berhad in 1994. It simply adopted the design setout by the EES feasibility study. In 1996, another unsolicited BOT proposal was received for the importation of treated water from the Inabanga River in Bohol through submarine and overland pipelines between Inabanga in Bohol and Cordova in Mactan Islands.[4] This represents the Phase I of the Bohol-Cebu Water Supply Project involving the treatment of water extracted downstream of the Inabanga River to provide 100,000 cum/d water flow to Cebu and 23,500 cum/d to nearby towns in Bohol.

[4]From the Alliance of Anglo-Philippines Holding Corporation, Brown and Root and Itocha Corporation.

None of these proposals has been approved, however, in part because of the apparently high price (in the order of P 20/cum at the old exchange rate) proposed for the bulk water to be sold to MCWD.[5] More importantly, these proposals required national government guarantees of purchase which is not allowed under the unsolicited BOT category. Unlike solicited BOT proposals which are evaluated through an open competitive bidding procedure, unsolicited BOT proposals are more like a negotiated contract, with a 60-day period provided for anyone to contest the proposal. Supposedly, unsolicited BOT proposals may be accepted only for projects embodying innovative technologies or ideas, which, strictly speaking, does not apply to either of the two proposals.

In the case of the Bohol-Cebu Phase I proposal, concerns have been raised about the potential political problems associated with inter-LGU transfer as experienced in the Compostela case, as well as technical issues related to the reliability of water supply from the Inabanga River during the dry season in the absence of an upstream reservoir which would be constructed only in the Phase II project.

Future surface water supply expansion projects of MCWD are prioritized in the following order: the Mananga Phase II, the 100-meter high dam along Balamban River in Lusaran to produce an additional 160,000 cum/d of raw water; the Inabanga River Phase I; and the Inabanga River Phase II which involves the construction of a 60-meter high dam upstream, together with a mini-hydropower and additional water treatment plant for an additional 260,000 cum/d raw water for Metro Cebu.

NET DEMAND - SUPPLY PROJECTIONS

In this section, alternative projections of demand and supply for urban water up to the year 2020 are analyzed to put in perspective the policy, institutional and regulatory reforms that will be needed to achieve a more efficient, socially equitable and sustainable water resource management in Metro Cebu.

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[5] In fact, the proposed price of bulk water from the Mananga Phase II is substantially higher than the per unit cost estimated by the Electrowatt study.

Table 3. Alternative Projections of Demand for Water in Metro Cebu by Type of User, 1995-2015 (Thousand cum/d)

	1995	2000	2005	2010	2015	2020
Households						
ELWATT	179.7	215.0	251.9	289.6	–	–
CIADP	184.2	230.4	286.9	356.0	–	–
EXPERT	167.2	193.8	222.7	260.4	–	–
JICA98[a]	–	–	–	–	–	–
PIDS1	195.7	238.4	286.2	338.7	395.0	453.9
PIDS2	195.7	238.4	286.2	338.7	395.0	453.9
Industrial and others						
ELWATT	43.9	66.8	97.6	135.0	–	–
CIADP	32.2	40.1	45.0	50.8	–	–
EXPERT	60.5	76.8	87.3	99.7	–	–
JICA98[a]	–	–	–	–	–	–
PIDS1	83.9	102.2	122.7	145.2	169.3	194.5
PIDS2	195.7	238.4	286.2	338.7	395.0	453.9
Total						
ELWATT	223.5	281.8	349.5	424.5	–	–
CIADPS	216.4	270.5	331.9	406.8	–	–
EXPERT	227.7	270.7	310.0	360.1	–	–
JICA98	161.9	211.5	316.2	478.4	609.3	763.3
PIDS1	279.6	340.6	408.9	483.9	564.3	648.4
PIDS2	391.4	476.8	572.4	677.4	790.0	907.8

[a] Projection was conducted for total demand as a whole.

Source: Electrowatt Engineering Services, Ltd. 1991; Expertelligence Development Corporation 1997; JICA Cebu Integrated Area Development Plan 1994; JICA Water Master Plan 1998.

DEMAND PROJECTIONS

Table 3 presents the various water demand projections conducted since 1991. Our review of the methodologies used in past studies suggests that projections of future water demand may have been underestimated, particularly the estimates for the nonhousehold use of water. For household demand, past studies assume base year per capita consumption for the poor households or "blighted" population to be way below (about 40 cum/capita) the average for the rest of the households (about 180 cum/capita) based on the observed levels of water consumption. In the latter case, the average per capita water consumption is based on observation from households connected to MCWD, adjusted upwards to correct for suppressed demand arising from water rationing. However, our study indicates that the much lower observed water consumption of the poor compared to the others reflects not only the effect of differences in income, but more importantly, the 5 to 10 times higher price typically paid by the poor who has to depend largely on vended water (Largo et al. 1998). Theoretically, if the purpose of the demand projection is to analyze its implications on water supply requirements, the appropriate method is to estimate the demand relative to a common price across the households, the wide difference in the price of water by source is expected to persist over time.

Because of limited data and empirical analysis of demand relationships for nonhousehold use of water, available projections of industrial, commercial and other water demand are even more problematic. Typically, these were estimated based on assumptions on water use per lot area and projections of industrial and commercial lot area (Expertelligence 1997; CIADP 1994). In the more recent JICA Water Resource Master Plan Study (1998), no distinction across uses was even made; and total water demand was projected on the basis of projected population growth and arbitrarily high assumed per capita water consumption (355 cum/capita) which presumably includes nonhousehold use of water.

To address the weaknesses of past projection, two alternative water demand projection (PIDS1 and PIDS2) are also reported in Table 3. The main difference from past studies is the much higher estimate of base year and projected water demand for nonhousehold uses. Given the limited data available to estimate nonhousehold use of water and lack of theoretical basis and crude nature of the estimates according to lot area, non-household water demand was estimated by adopting the ratio of industrial/ commercial to total water consumption commonly observed internationally. A high estimate is made by assuming a ratio of approximately 50 percent (PIDS2), similar to the ratio in Bangkok, Kuala Lumpur, and Singapore where the service coverage of water utility is 100 percent and to the average ratio generally reported worldwide especially at the early stages of economic development (Renzetti 1992; Water Utilities Data Book 1997). A low estimate (PIDS1) is also provided, assuming the ratio of industrial/ commercial to total water consumption of 30 percent, the ratio observed in developed countries where a relatively high water price and appropriate sewer and effluent charges have reduced water consumption through adoption of water saving technological processes, as well as recycling and reuse of water. Both ratios are higher than those obtained in the other projections, e.g., 12-15 percent for CIADP, 26 percent for Expertelligence, and 20-30 percent in the Electrowatt study.

Our projection of household demand for water is based on a higher projected population growth rate than the Electrowatt study, but lower than those assumed in all the other three studies. Moreover, instead of making separate demand projections for the poor and the rest of the population, a relatively low rate of average per capita water consumption was applied for the whole (150 lcpd, and increasing by 1% per year) population.

Overall, our projected water demand is generally higher than past projections; the low estimates (PIDS1) are about 20 percent higher, while the high estimates (PIDS2) are as much as 60 percent more than the earlier projections. It is interesting, however, that the 1998 JICA projections for year 2015 and beyond are even higher that our low estimate as shown in PIDS1.

NET DEMAND – SUPPLY GAP

In Table 4, the alternative demand projections are shown together with those of net water supply (i.e., net of assumed nonrevenue water), the amount of water available for sale by MWCD.[6] In year 2000 column,

[6]The rate of nonrevenue water is assumed to decrease from 38 percent in 1995 down to 35 percent in 2000, 30 percent in 2005, and 25 percent in 2010 and beyond.

Table 4. Alternative Projections of Net Demand Supply of Water in Metro Cebu

	1995	2000	2005	2010	2015	2020
Demand						
ELWATT	223.5	281.8	349.5	424.5	–	–
CIADPS	216.4	270.5	331.9	406.8	–	–
EXPERT	227.7	270.7	310.0	360.1	–	–
JICA98	161.9	211.5	316.2	478.4	609.3	763.3
PIDS1	279.6	340.6	408.9	483.9	564.3	648.4
PIDS2	391.4	476.8	572.4	677.4	790.0	907.8
Net MCWD supply*	67.1	102.1	291.9 [179.9]	410.3	605.3	605.3
Net D-S gap**						
ELWATT	156.4	179.7	57.6 [169.6]	14.2	–	–
CIADPS	149.3	168.4	40.0 [152.0]	(3.5)	–	–
EXPERT	160.6	168.6	18.1 [130.1]	(50.2)	–	–
JICA98	94.8	109.4	24.3	68.1	4.0	158.0
PIDS1	212.4	238.5	117.0 [229.0]	73.6	(41.0)	43.1
PIDS2	324.2	374.7	280.6 [392.6]	267.2	184.7	302.4

* Figures in brackets are supply and net D-S gap without the Lusaran Dam project.

** Figures in parentheses are surpluses.

it is assumed that the Mananga Phase I and Compostela wells will be fully operational. The net supply figure for 2005 includes the water expected from the Mananga Phase II and the Lusaran Dam, while the figure in brackets excludes the potential water supply from the Lusaran Dam. In year 2010, water from the Phase I of the Cebu-Bohol water supply project is added and in 2015, Phase II of the project is assumed to be completed.

Although there are wide variations in the estimated net demand-supply gaps, it is clear that groundwater mining will continue to worsen even with the successful operation of the Compostela Wellfield, the Mananga Phase I, and the completion of Mananga Phase II early in the next century. In fact, the "low" PIDS1 projection indicates that only with development of all the proposed surface water supply expansion projects can groundwater depletion be controlled in Metro Cebu, at least up to 2025. Based on the highest estimate of safe or sustainable groundwater extraction of 164,000 cum/day (JICA 1998), sustainable private groundwater extraction is only about 52,000 cum/day. Indeed, if there are no efforts to conserve water and the future demand for water is closer to the "high" PIDS2 projection, supply-expansion strategies alone will fail to control groundwater mining.

CLOSING THE GAP

Undoubtedly, water demand management strategies must be adopted immediately, together with efficiency improvements and surface water supply development on the supply side. The key instrument for managing water demand is to institute an optimal water pricing policy, i.e., the price of water to users that reflect its full economic cost, including the direct supply or financial cost of production and distribution, the opportunity cost of water, and the environmental or cost of externalities incurred in water production and consumption.

Demand function estimates for households and industrial and commercial firms do show significant price responsiveness (Largo et al. 1998; Inocencio et al. 1998). In other words, the scope for reducing the water demand-supply gap by raising water tariffs and imposing sewerage charge and effluent tax is substantial. The current pricing policy structure fails to account for the scarcity or opportunity cost of groundwater as raw water continues to be free for MCWD and self-supplied households, industrial, commercial and other users. Neither does it consider the environmental cost of domestic and industrial wastewater as no appropriate sewerage charges and effluent taxes have been levied. Such undervaluation of water and related factors lead to a) wasteful usage of water by final consumers and raw water by water utility firms (as evidenced by the high rate of nonrevenue water), b) misallocation of freshwater in favor of less valuable uses (e.g., fishery and irrigation over urban use), c) worsening of water pollution problems, and d) failure to invest in the necessary investments for water supply expansion in a timely manner.

Although the current water pricing policy of MCWD covers only the financial cost of production and distribution (including the capital and operation and maintenance costs), it should be noted that the structure of its water tariffs is relatively high in comparison with other water districts in the country (Table 5). For water consumption below 30 cum/

Table 5. Water Charges of Selected Water Districts (P/cum)

Water district	Minimum charge (P/conn/) (month)	Consumption bracket (cum)			
		11-20	21-30	31-40	41-50
Metro Cebu	90.65	10.00	11.76	32.26	32.26
Metro Manila[a]					
East Zone	19.60 (7.78)	2.15 (0.95)	2.20 (1.00)	2.20 (1.00)	3.71 (2.37)
West Zone	29.40 (16.69)	3.33 (2.03)	5.36 (3.87)	5.36 (3.87)	6.70 (5.09)
Dasmariñas	35.00	6.00	6.75	7.75	8.90
General Santos	50.00	5.60	6.08	7.04	8.00
Davao City	50.00	5.25	6.80	9.00	15.00
Dumaguete	54.00	5.50	6.50	7.50	8.50
Olongapo	57.00	6.05	6.90	8.15	8.15
Laguna	58.50	5.85	6.90	8.40	9.85
Subic	72.00	8.00	9.00	10.50	10.50
Metro Iloilo	80.00	8.00	8.80	10.40	10.40
Metro Siquijor	99.00	14.70	16.30	18.40	18.40
Tagaytay	110.00	5.80	7.05	9.05	11.85
Baguio City	120.00	13.50	15.00	17.00	17.00

[a] For Metro Manila, these charges refer to households and include CERAI, and environmental fee. Figures in parenthesis refer to water tariffs alone. For other water districts, there is no price differentiation across types of users.

Source: LWUA and MWSS

month, MCWD's water tariff is higher than most major cities with the exception of Baguio City and Metro Siquijor. At higher consumption brackets, Metro Cebu has the highest water tariff at P32.26/cum. Indeed, MCWD's average water tariff is also among the highest among major ASEAN cities, next to Singapore, and about twice the average in the region (Table 6). In fact, MCWD's water tariff is the highest at consumption

Table 6. Domestic Water Price Structure for Household in Selected Utilities in the ASEAN Region, 1995 (US$/cum)[a]

Population coverage	Water prices						
	Average price[g]	Consumption bracket (cum.)					
		1-10	11-20	21-30	31-40	41-50	51-60
Cebu City[f]	.66	.33	.36	.42	1.16	1.16	1.16
Davao City	.27	.08	.20	.26	.34	.46	.46
Bandung	.37	.12[e]	.20	.20	.24	.24	.32
Chiangmai	.30	.15	.18	.26	.34	.34	.36
Penang	.21	.09	.09	.17	.17	.17	.17
Manila[b]							
East zone	.14	.07	.08	.08	.08	.14	.14
West zone	.25	.11	.13	.20	.20	.25	.25
Jakarta	.61	.16	.16	.16	.31	.31	.35
Bangkok	.31	.16	.16	.16	.22	.23	.25
Kuala Lumpur	.34	.17[d]	.26	.26	.26	.42	.42
Singapore	.55	.39	.39	.56	.56	.82	.82

Source: ADB Water Utilities Data Book, 1997.

[a] Currency conversions are based on foreign exchange rates as of 1 July 1997, i.e., P26.384/$1.00

[b] Refers to the composite price including a currency adjustment factor and an environmental fee of 10 percent of base price.

[c] Effective August 1996 to July 1997.

[d] 0.17 applies to consumption up to 15 cubic meters; 0.26 applies to consumption from 15 to 40 cubic meters.

[e] 0.12 refers to consumption up to 15 cubic meters; 0.20 refers to consumption from 15 to 30 cubic meters.

[f] In Cebu City, same rates apply to all users.

[g] Refers to average price across all users.

bracket above 30 cum/month. By contrast, with the privatization of the MWSS, Metro Manila now has the lowest water charges among water districts in the country as well as among ASEAN cities.

It should be noted that the scope for increasing efficiency of MCWD and operations appear to be large and should be pursued vigorously, considering the relatively high water tariffs, particularly for large-scale users, and the relatively high cost of surface water supply development. For example, the rate of nonrevenue water of MCWD is 38 percent, as compared to a 30 percent overall average for developing countries and 10 percent for the more efficient water utility firms. The number of employees per 1000 connections is a high 9.3 compared to 4.6 in Bangkok, and only 1.1 and 2.0 in Kuala Lumpur and Singapore, respectively. In Metro Manila, the number of employees per 1000 connection has dropped from over 10 to 5.5, less than a year after the MWSS privatization. The recent problems encountered in the operations of Compostela wells and completion of Mananga Phase I have significantly reduced returns to those investments indicating the need to improve the legal framework for effecting inter-LGU water transfers and upgrade institutional capacity for implementing water supply expansion projects, in order to minimize losses in capital investments.

Clearly, an optimal water pricing policy will mean higher average water charges, as a raw water charge will have to be imposed, together with sewerage charge and effluent taxes. Privatization of MCWD can be expected to lower the financial cost of operation, however, if conducted in a transparent competitive manner and if a competent regulatory office is put in place. And finally, improved water service will save final consumers the additional costs incurred in coping with rationed water supply.

It should be emphasized that optimal water pricing may be expected to improve the quality of water service and the environment, without necessarily reducing the welfare of poor households, if this leads to greater direct access to MCWD water. Our survey showed that with the limited supply of MCWD water, most poor households rely on vended water that is typically 5 to 10 times more expensive than the official price of MCWD water though many are actually buying the same water from neighbors with connections (Table 7). Furthermore, Table 8 which reports the average cost of water by income class shows the highly regressive nature of the actual water cost structure despite the progressive character of the

Table 7. Average Cost of Water and Distribution of Households by Source of Water, Metro Cebu, 1997

Source	% of household	Average cost (P/cum)	Monthly income (P/capita)
MCWD	33.9	12.0	2503.2
Private waterworks	4.1	12.6	7645.7
Self-supplied			
Deepwell	15.9	56.5	1370.8
Artesian well	2.4	0.0	1293.4
Public faucets	9.7	14.1	1427.2
Water vendors			
MCWD water			
51	9.2	76.3	1189.0
61	1.1	59.8	1696.7
71	*	53.2	1200.0
81	*	106.4	750.0
91	*	66.5	4000.0
Deepwell			
52	2.1	76.3	1189.0
62	–	–	–
72	–	–	–
82	*	132.9	1025.0
92	0	3.4	1100.0
Multi-Sources	21.6		

Source: Largo et al. (1998).

Table 8. Average Cost of Water by Income Class, Metro Cebu, 1997

Income class	Average cost (P/cum)	% of water bill to income cost-inc
Under P30,000	34.96	8.78
P30,000-39,999	30.59	4.07
P40,000-59,999	22.37	4.03
P60,000-99,999	24.68	3.22
P100,000-149,999	17.02	2.50
P150,000-199,999	17.50	1.84
P200,000-249,999	10.72	1.67
P250,000-499,999	10.50	0.82
P500,000-749,999	7.06	0.53
P750,000-999,999	8.67	0.34
P1,000,000 & over	11.88	0.78

Source: Largo et al. (1998).

MCWD pricing structure. Hence, imposing raw water and domestic sewer charges that facilitate the more efficient, equitable, and sustainable management of urban water resources may actually lower the effective cost of water to poor households, as they gain access to MCWD water that would be less costly than vended water despite the additional charges.

Moreover, optimal water pricing need not threaten competitiveness of industrial and commercial firms. There is widespread evidence in developed countries that higher water tariffs and effluent taxes have reduced water consumption without impairing industrial growth (Jaffe et al. 1995). Firms responded by modifying processing and cooling methods, and adopting water reusing and recycling practices. Potentials for water conservation and use of water saving technologies for household use of water are also strong.

IMPLICATIONS FOR POLICY AND INSTITUTIONAL REFORMS

To promote a more efficient, equitable, and sustainable urban water resource management, in Metro Cebu, the following policy and institutional reforms are called for:

1. Adoption of water (and its related components) pricing policy that covers the full economic cost of urban water use, i.e., direct supply or financial cost of water production and distribution; opportunity cost of water where there are competing users; and cost of externalities or negative environmental impacts. Specifically,
   a) A raw water charge that should reflect the opportunity cost of water and/or environmental cost of water extraction from surface or groundwater sources must be imposed on MCWD as well as self-supplied water users. The MCWD recently began collecting raw water charge on groundwater used by self-supplied large industrial firms, presumably for reforestation. We argue, however, that this should be collected by the government and levied on all users for as long as the additional cost of collection is less than the additional revenue. The raw water charge should, in principle, be ultimately high enough to reduce groundwater abstraction down to sustainable yields and generate sufficient revenues to finance the necessary water resource management

activities. Further studies must be conducted to determine cost-effective ways of collecting abstraction fees because of inherent difficulties in enforcement.

b) Sewerage fees must be introduced among customers of MCWD, as well as to self-supplied water users to cover the cost of its effective regulation and the necessary collection, treatment, and disposal sewerage disposal system.

c) Taxation of industrial effluents must be institutional as an integral part of environmental management in Metro Cebu.

d) The progressive character of the water tariff structure should be maintained for purposes of cross-subsidizing the poor and encouraging water conservation. However, the wide differences (2 to 3 times) in water tariffs between small and large users or effectively between households and industry/commercial users may be narrowed to further discourage groundwater pumping by commercial and industrial firms. Of course, large water users may still be expected to use their own wells because of economies of scale.

2. Government revenues from raw water charges, effluent taxes and sewerage fees should be earmarked for water resource management-related activities. Whereas revenues from effluent taxes and sewerage fees should finance the cost of environmental management, raw water revenues may be used to:

   a) finance part of the direct supply cost of surface water development and replenishment of groundwater;
   b) compensate poor farmers for the reallocation of irrigation water to urban use either directly or by developing alternative sources of irrigation water;
   c) support cross-subsidies in favor of the poor, especially those who may have to rely on higher cost sources of water supply;
   d) finance part of the cost of watershed protection; and
   e) strengthen the government's water resource management capabilities by funding the following activities:
      * improving the statistical database required for proper water resource management including monitoring of stream flow

of relevant surface water sources, extraction and recharge rate of groundwater, water quality, and so forth;

* strengthening the analytical bases for more accurate water demand projections and water supply and sewerage planning, e.g., *ex ante* and *ex post* evaluations of potential and completed water supply and sewerage projects; and
* conducting long-term research on water resource management issues.

3. Introduce institutional reforms to improve efficiency in water production and delivery; facilitate intersectoral, inter-basin and inter-LGU water transfers; and strengthen planning, regulatory and overall public sector water resource management capacity. For example:
   * Where direct involvement of the public sector has led to inefficiencies in water supply development and operations of water utilities, privatization should be pursued under a transparent and competitive bidding procedure. Clearly, the privatization of the MCWD should be considered. However, realization of the full potential gains from privatization over the long term largely depends on the ability of the regulatory office to monitor attainment of performance targets at the same time ensuring reasonable (not monopolistic) rates of return for the private concessionaires. Therefore, there is an urgent need to strengthen local capability for designing optimal contractual arrangements and performing economic regulatory functions.
   * The recent surge in unsolicited BOT proposals for the development of water supply projects must be viewed with extreme caution. In fact, these proposals such as that one for Mananga Phase II for Metro Cebu should have been solicited and chosen through the usual competitive bidding procedure because these have been previously identified and feasibility studies have already been undertaken. Since unsolicited BOT proposals as well as BOT proposals solicited with haste are typically more costly, the public sector must be more vigilant in ensuring competition and invest more

resources for water supply project planning, feasibility studies, monitoring of implementation and ex post project evaluations.

* With the passage of the Local Government Code and the naturally limited supply of freshwater in Metro Cebu, mechanisms for inter-basin or more specifically, inter-LGU transfers of water resources will have to be developed. The lack of legal basis and operational guidelines for effecting such water transfers has proven to be very costly in the case of the ongoing controversy over the operations of the MCWD wells in Compostela.
* The complex nature of water resource management clearly requires a more integrated and holistic approach in addressing the inherently interrelated issues of water supply planning and operation, demand management, pollution control and watershed and groundwater protection. Thus, the fragmented and relatively weak institutional structure of the water resource management will have to be addressed to ensure effective coordination of policies and programs.

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